

## **THE BENEFIT OF THE COMBINATION OF $^{14}\text{C}$ AND AMS ANALYSIS FOR SOURCE APPORTIONMENT OF CARBONACEOUS AEROSOLS**

Soenke Szidat<sup>1</sup>, Imad El Haddad<sup>2</sup>, Andre S. H. Prevot<sup>2</sup>

1 Department of Chemistry and Biochemistry & Oeschger Centre for Climate Change Research, University of Bern, Switzerland

2 Laboratory of Atmospheric Chemistry, Paul Scherrer Institute, Villigen, Switzerland

Source apportionment of carbonaceous aerosols is a difficult task due to complexity of primary emissions and secondary organic aerosol (SOA) formation. In recent years, measurement techniques as well as statistical tools have been refined in order to improve this situation. On the one hand, the separation of organic carbon (OC) and elemental carbon (EC) for  $^{14}\text{C}$  (radiocarbon) analysis has been improved so that artefacts on the distinction of fossil and non-fossil sources of OC and EC are reduced (Zhang et al., 2012). On the other hand, aerosol mass spectrometry (AMS) has become a frequently used tool to classify the organic aerosol (OA) into hydrocarbon-like OA (HOA), biomass-burning OA (BBOA), low-volatility oxygenated OA (LV-OOA), semi-volatile oxygenated OOA (SV-OOA) and even more fractions (Jimenez et al., 2009). This development has been supported by specific laboratory procedures such as off-line AMS and statistical tools for source apportionment like chemical mass balance (CMB), positive matrix factorization (PMF) and the multilinear engine (ME-2) (Huang et al., 2014).

In this work, we present how source apportionment can be improved by combination of  $^{14}\text{C}$  analysis, AMS measurements and statistical tools. First, a comparison of the complimentary methods allows the quality assurance of the individual results. Second, SOA formation can be attributed under certain conditions to fossil and non-fossil precursors either by estimation of the  $^{14}\text{C}$  level for LV-OOA and SV-OOA (Huang et al., 2014; Zotter et al., 2014) or by application of CMB results from organic marker compounds (Zhang et al., 2015). Examples from Los Angeles, China and Europe are shown.

Huang et al., *Nature* 514, 218-222 (2014).

Jimenez et al., *Science* 326, 1525-1529 (2009).

Zhang et al., *Atmos. Chem. Phys.* 12, 10841-10856 (2012).

Zhang et al., *Atmos. Chem. Phys.* 15, 1299-1312 (2015).

Zotter et al., *J. Geophys. Res. Atmos.* 119, 6818-6835 (2014).